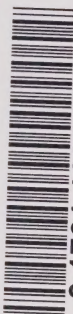


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CANADA
DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

(Annual)
REPORT

OF THE

EXPLOSIVES DIVISION

OF THE

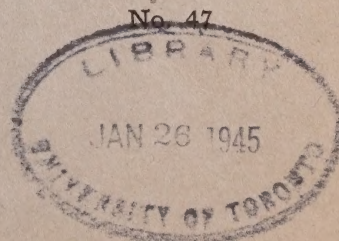
BUREAU OF MINES

FOR THE CALENDAR YEARS

1939—1943



1944



CANADA
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**REPORT
OF THE
EXPLOSIVES DIVISION OF THE BUREAU OF MINES
FOR THE CALENDAR YEARS 1939-1943**

BY
F. E. Leach

The following report deals with the administration of the Explosives Act and Special War Regulations during the five-year period 1939-1943.

ACCOMMODATION

The main offices of the Division were moved from the old Mines Branch Building on Sussex Street to more commodious quarters in the Norlite Building, Wellington Street, in June 1942, the greater part of the ground floor having been made available for the use of the Division. The site is central and convenient of access by the public and members of the staff. The rooms are large, well lighted, modern, and are much better suited to the needs of the Division than were those formerly occupied.

The Division and the National Research Council are engaged in closely related and interlocking work in connection with research into and testing of all types of explosives. It was clearly seen that the various lines of investigation and testing could be done to best advantage in one central station, and after thorough discussion an arrangement was made whereby the activities of the two organizations could be carried on together. The National Research Council provided an excellent site on its property on the Montreal Road, about 2 miles east of Eastview, and erected the necessary buildings at its own expense. The Explosives Division moved all its apparatus and testing equipment from the old explosives laboratory on Booth Street to the new site in July 1942, and the new Explosives Research Laboratories were put under the supervision of an inspector of the Division who serves as Acting Chief Explosives Chemist.

The Laboratories consist of three main buildings. One of these houses the administrative offices, a large chemical laboratory, and two smaller laboratories for chemical or physical research work. There are, also, rooms designed and fitted for microscopic, spectroscopic, and similar investigations; a heat-test room; and a balance room. All the furnishings and equipment are of the most modern type, and additions are being made as required. The second building contains friction machines, ballistic mortar, impact test machines, and other related equipment. It is well lighted and is equipped with a forced ventilation system by means of which any

noxious fumes can be quickly expelled from the building. The third building consists of four rooms separated by heavy concrete walls and provided with blow-out fronts. One of these rooms contains a Bichel gauge of the same type as that used in the United States testing station at Bruceton, Pa.; the other rooms are for use in examining special explosives, preparation of charges, or for other work that should be carried on in seclusion. The Laboratories are furnished with the necessary magazines.

A large excavation has been made in an outcrop of limestone in which it is proposed to erect a soundproof building for determining velocities of detonation, making explosion-by-influence tests, and similar uses.

STAFF

At the beginning of the war the regular technical staff of the Division consisted of a chief and one inspector, both located in Ottawa, and one inspector with headquarters in Vancouver. The clerical staff was made up of one male and three female employees, all in Ottawa. By the end of 1943, because of the great increase in inspectional work caused by the operation of new war plants, it had become necessary to add three officers to the inspectional staff and one to the Research Laboratories. The clerical staff was also increased by ten. All appointments made during the war are temporary. The Acting Chief Explosives Chemist has supervision of all the chemical work of the Division and of that part of the staff of the National Research Council engaged in physical-chemical investigative work in the Explosives Research Laboratories.

Because of the additional work in the inspection of new explosives factories it was found necessary to transfer the inspector for Western Canada from Vancouver to Ottawa.

GENERAL WORK OF THE DIVISION

Prior to the war the inspectors were largely occupied in making inspectional trips throughout the country. Besides inspecting plants manufacturing commercial explosives, ammunition, fuse, and fireworks, they gave a great deal of attention to the storage of explosives in magazines or temporary magazines, and to seeing that the licensees complied with the terms of the licences. At that time it was legal for individuals to store for resale up to 150 pounds of explosives in what were known as unlicensed premises. These places of storage were regularly inspected, as were also the stocks of ammunition and fireworks held by the retail trade. Major accidents in manufacture were investigated and reported upon, and, where possible, inquiries were made into any unusual occurrence in the use of explosives.

Soon after the start of the war the newly organized Department of Munitions and Supply undertook a vast program for the production of explosives and ammunition of all kinds, which involved the construction of many new factories. Most of these factories are the property of the Crown, but are operated for the Government by private companies. The Division assisted in designing the plants, interpreting the safety rules, and determining the relaxations that could be made in the peacetime regulations regarding the construction and location of danger buildings so as to give reasonable safety to the public and operatives, and at the same time protect the public purse and expedite the production of needed munitions.

There is always a three-sided rivalry going on in these large plants. Those responsible for the expenditure of funds wish to keep down capital outlays and to control production costs; the production people want to show a very large output; and the safety men are primarily concerned with the safety of the employees and the public. It has been the delicate duty and responsibility of the Division to find a reasonable compromise between these three viewpoints and it is acknowledged, with pleasure, that the task has been made as easy as possible by the co-operation and helpful attitude of the officials of the companies concerned.

As the new plants began to come into production the staff of the Division was more and more occupied with war work and much less time was available for duties of a peacetime nature. The Royal Canadian Mounted Police took on nearly all the inspection of magazines and unlicensed premises, so that the Division was able to concentrate on factories. The number of factory inspections rose from 36 in 1939 to over 200 in 1943.

From the beginning of the period under review until the outbreak of war the staff of the explosives laboratory on Booth Street was almost entirely engaged in routine chemical and physical examinations and check analyses of standard commercial explosives. Subsequently, the research work carried on by the universities under direction of the National Research Council resulted in the production of a very large number of samples of proposed explosives and components of explosives, and these were submitted to the laboratory for test, proof, and investigation as to their stability and other properties. Close collaboration was maintained with the Inspection Board of the United Kingdom and Canada, and the different branches of the armed forces were assisted in connection with the design and production of various devices adapted for special purposes. Investigations were conducted into the causes of accidents in manufacturing various pyrotechnics, smoke mixtures, and explosives. The change in the activities of the laboratory staff was accentuated after the establishment of the Explosives Research Laboratories, and from then onwards all of their work has been of direct war interest.

Members of the laboratory staff were active on various Canadian and international explosives committees.

LEGISLATION

Officers of the Division assisted in drafting parts of the Defence of Canada Regulations and certain Orders in Council that were passed under authority of the War Measures Act. These included:—

1. P.C. 2903 of July 4, 1940, as amended by P.C. 25/4600 of June 25, 1941. This regulates the possession, use, and sale of explosives. It provides that none may be sold except by the operator of a licensed factory or magazine, and that only the holder of an explosives purchase permit or of a magazine licence may purchase explosives.
2. P.C. 1542 of February 26, 1942, which restricts the possession of explosives by Japanese.
3. Regulation 37A (Defence of Canada Regulations), which restricts the possession of explosives by aliens.

4. P.C. 3561 of April 30, 1942, which prohibits the possession of matches and smoking in factories and in explosives magazines.
5. Regulation 38AA, D.O.C.R., which prohibits the possession of matches or smoking in vessels loading explosives.
6. Ministerial Order, Department of Transport, regarding conveyance of explosives by railroad, aircraft, or vessel.
7. Ministerial Order, Department of Mines and Resources, regarding conveyance of explosives other than by railroad, aircraft, or vessel.

P.C. 2903 is the most far-reaching of these restrictions. This measure makes it obligatory for a person who wishes to buy explosives for any purpose to obtain an explosives purchase permit from the police. At first there was a certain amount of resentment over this regulation because of the extra work involved, but after users became accustomed to it this feeling largely died out. Doubtless, however, some inconvenience and extra expense is involved in cases where people live in places that are remote from the police.

Because of the difficulty of finding trained help for new explosives plants, thousands of employees were engaged who had no previous experience in this type of work and little appreciation of the dangers inherent in handling explosives. A great deal was done by management in a variety of ways to warn and impress on workers the dangers of carrying matches and of smoking in explosives plants, but it was found impossible to control these dangerous practices with the penalties provided under the Explosives Act. Accordingly, Defence of Canada Regulations were amended by P.C. 3561 (*see above*) and persons now carrying matches or lighters in forbidden areas are subject on summary conviction to a fine of not less than \$50 and not more than \$100, and those found guilty of smoking, to imprisonment for a term of not less than three months and not more than twelve.

MANUFACTURE OF EXPLOSIVES

There was great activity in the manufacture of blasting explosives in the years 1939 to 1941 inclusive, and in each of these years there was a slight increase in output over the preceding year. This activity was largely accounted for by the construction of airports, factories, and other enterprises concerned with the war effort. In 1942 the output began to decline mainly because of the restricted activity in gold mining, and because less new construction work was being undertaken. Early in 1943 the manufacture and distribution of commercial ammunition was strictly curtailed in order to make more labour, material, and machines available for the production of military ammunition.

In reference to the aforementioned explosives production program of the Department of Munitions and Supply it may be noted that from February 1940 to the end of 1942 one company alone brought twelve new units into operation and had two other units under construction. The new factories built under the program manufacture high explosives for bursting charges, propellants, initiators, chemicals, and pyrotechnics, and are operated under licences and inspection of the Division. Large new plants for making small arms ammunition were built, and others for use

in filling mortar and artillery ammunition, grenades, mines, aerial bombs, torpedoes, fuzes, and many varieties of military pyrotechnics were also constructed. It was necessary for officials of the companies who carried out the program to build up staffs of engineers and executives previously inexperienced in handling explosives. In a short period these officials attained full production of excellent products. The number of accidents is extraordinarily low, considering the magnitude of the undertakings, the dangerous nature of many of the materials handled, and the great number of men and women employed in work in which they had had no previous experience.

ACCIDENTS IN MANUFACTURE OF COMMERCIAL EXPLOSIVES

There were six major accidents in the five-year period, accounts of which are given by years below.

1939

A flash occurred in one cubicle of a room where metallic ammunition was being loaded with gunpowder. The gunpowder was supplied to the cubicle from a receptacle fastened to the exterior of the outside wall of the room. A copper pipe conveyed the gunpowder from the receptacle through the wall to the cubicle. This pipe was provided with a brass slide valve operated from inside the cubicle by means of a rod that passed through the wall. Some of the gunpowder in the receptacle had become caked. The service man on the powder-way outside the building attempted to break up this cake with a copper rod and, at the same time, the operator inside the cubicle agitated the valve rod. In some way at this time sufficient local heat was generated to explode the gunpowder in the receptacle. It flashed down the service pipe and ignited a small quantity in the cubicle. Two men died from the ensuing burns.

1940

An explosion occurred in a black powder press house that resulted in the death of one man, the operator of the press. The building and the press were completely demolished. It was impossible to determine definitely the cause of the accident but it was probably due to failure of equipment.

1941

While operating a decapping machine for shotgun cartridges an explosion occurred in the primers that had been removed from the shells. A part of the machine was projected across the room, striking a man on the head and causing a fatal injury. The operator of the machine was thrown to the floor and sustained fractures of both legs.

The operation of decapping is performed by an operator seated in front of a machine that consists of a rotary dial having holes in which the shells are placed, and plungers that extract the primer assembly and then the shells. The primers, enclosed in battery pockets, fall through a delivery pipe into a box beneath the machine. Shells are delivered into a receptacle beside the machine. The operator feeds the primed shells into holes in the rotary dial, the rest of the operation being practically automatic.

The extracted primers are removed from time to time by a service man. The operator is protected by sheet-steel plates fastened to the legs of the extracting machine.

The explosive composition forms only a small part of the primer assembly, and it was not considered possible that a mass explosion could occur under these conditions. However, during the operation one of the primers flashed and this flash communicated through the delivery pipe to the extracted primer assemblies in the box under the machine. It is thought that a certain amount of loose composition must have been formed during the operation and had been scattered through the pile of primers.

A fire broke out suddenly in a small building used for grinding and screening potassium nitrate. The operator was enveloped in flame, with fatal results. It was impossible, because of the complete destruction of the building and the lack of witnesses, to determine the cause of this accident.

1942

In a fireworks' factory an operator was engaged in mixing a green star composition when it ignited and then detonated. The operator was killed and three others were injured by missiles. The building, a small one-room structure, was destroyed and debris was strewn over a considerable area. The sensitive composition was mixed by passing it a number of times through a screen by hand. It is probable that some undue force was used and that the friction produced caused the composition to fire. In a few seconds the critical temperature was reached causing the remainder of the mix to detonate.

An explosion of unknown origin completely destroyed the glaze mill and corning mill with their barricades on a black powder line and fired the charge in a wheel mill with consequent destruction of the house containing it. The barricades of this structure, however, were not damaged. Heavy debris was scattered in all directions for as much as 600 feet from the centres of explosion. This debris was responsible for the deaths of two men.

MAGAZINES

The number of magazines under licence during the period 1939 to 1943, inclusive, is shown in the table below. The increase in the number of temporary magazines during the period can be traced to the many new projects of various kinds connected with the war effort, such as the construction of strategic roads, airports, and increased harbour facilities.

Magazine Licences

Year	Magazine Licence	Temporary Magazine Licence	Total
1939	333	226	559
1940	329	227	556
1941	298	327	625
1942	349	371	720
1943	371	373	744

Licensees gave excellent co-operation to the Division and the various police forces in their efforts to ensure that explosives would not get into the hands of unauthorized persons that might make use of them for acts of sabotage.

Inspections of magazines by the Division's inspectors have been greatly curtailed because of the increased demands of war plants, but Deputy Inspectors of the Royal Canadian Mounted Police, who have assisted in the past, greatly increased the number of their inspections. Inspectors of the Explosives Division made a total of 1,181 inspections, and 3,213 were made by Deputy Inspectors of the Royal Canadian Mounted Police. Magazines in Yukon Territory are regularly inspected by the Royal Canadian Mounted Police, who, as occasion permits, also inspect magazines in the Northwest Territories. Acknowledgment is also made of the valued assistance given on many occasions by the Provincial Police of British Columbia and Ontario.

THEFTS OF EXPLOSIVES

During the five-year period 96 thefts from magazines and unlicensed premises were reported. These involved 4,777 pounds of blasting explosives, 7,267 detonators, and 25,500 rounds of ammunition. The quantity of explosives stolen shows a marked reduction over the period. Undoubtedly, the protective measures taken by licensees have been of great assistance in reducing thefts of explosives.

EXPLOSIVES FOUND

Over 200 lots of explosives were found. Many of these had been left or abandoned by prospectors, mining and construction companies, or hidden by thieves for later use. The explosives found comprised 10,059 pounds of dynamite, 5,626 detonators, 19,495 feet of safety fuse, 25 pounds of black powder, 24 ounces of nitroglycerine, and 1,000 rounds of ammunition.

EXPLOSIVES DESTROYED

A large quantity of deteriorated explosives was destroyed during the period. On one occasion 11,600 pounds of black blasting powder, the property of a construction company, was destroyed by officials of the company. The Royal Canadian Mounted Police supervised the destruction of 18,000 pounds of deteriorated dynamite left on a mining property in the Northwest Territories. A farmer in Ontario had stored on his farm, for about 27 years, 12,700 detonators and 2,250 pounds of black powder that had become unfit for use because of lack of protection from the weather. The detonators and powder were destroyed by officers of the Division assisted by the Royal Canadian Mounted Police. The explosives destroyed during the five-year period comprised 58,386 pounds of dynamite, 37,425 detonators, 16,246 pounds of black powder, 15,774 feet of safety fuse, and 36 pounds 2 ounces of nitroglycerine. Of these explosives, 24,056 pounds and 5,585 detonators were from licensed magazines, and the remainder from mine properties and other premises not licensed under the Explosives Act.

UNLICENSED PREMISES

The sale of explosives from unlicensed premises was prohibited by the passing of P.C. 2903 (July 4, 1940) and all sales of explosives thereafter could be made only from licensed magazines. By the issue of Explosives Purchase Permits, made necessary by the above Order in Council, every sale of explosives was recorded. The information thus obtained has proved of great service to the police and to the Division. It provides a check on all users of explosives and gives to the Division an opportunity to instruct occasional and inexperienced users regarding safe practice in storing and handling explosives.

During the five-year period inspectors of the Division made 2,601 inspections of unlicensed premises; and over 19,000 inspections were made by Deputy Inspectors of the Royal Canadian Mounted Police.

PROSECUTIONS

Proceedings were taken in 37 cases for violation of the provisions of the Explosives Act. The offences for which legal actions were taken are grouped as follows:—

- Improper transportation.
- Failure to keep record of sale of explosives.
- Improper storage.
- Trespassing on premises of an explosives factory.
- Possession of matches and smoking in explosives factories and shell-filling plants.

Proceedings were also entered in 70 cases under P.C. 2903, chiefly for failure of possessors of explosives to obtain explosives purchase permits. Twenty-four prosecutions were entered under the Criminal Code and sentences ranging from a few days to seven years were given.

Notwithstanding the stringent penalties under the Regulations there are many who still persist in carrying matches and in smoking in dangerous areas, endangering their own lives and those of their comrades. Probably the most flagrant example of this was when two men were found smoking cigarettes in a room used for screening T.N.T. From May 5, 1943, when P.C. 3561 was published in the *Canada Gazette*, until the end of 1943 a total of 240 employees of explosives factories were fined \$50 each for carrying matches, and 18 were sentenced to terms of imprisonment ranging from three months to five months for smoking.

IMPORTATIONS

A statement of the explosives imported during the five-year period is given in Appendix B. These imports were made under authority of 2,358 permits and 232 special permits.

No Chinese fireworks were imported from 1939 to the end of 1943. The other explosives imported were mainly for use in explosives factories, and for other manufacturing purposes, such as paint, lacquer, etc.

AUTHORIZATION OF EXPLOSIVES

No new commercial explosives were authorized for manufacture in Canada during the period, but minor changes in the formulae of some explosives already authorized were approved. A list of explosives authorized for manufacture or use in Canada is given in Appendix D. It is similar to the list published in 1938 except that several outside manufacturers of explosives, whose products have not been imported for a long period of years, are omitted. The names of these manufacturers may be obtained on inquiry. Manufacturers of explosives and fireworks in Germany, Japan, and enemy-occupied countries are not listed.

ACCIDENTS

A summary of the accidents recorded during the years 1939 to 1943 inclusive, classified according to their causes, is given in Appendix C. From year to year the chief causes vary little and are as follows:—

1. Prematures, and failure to get away from the scene of blast.
2. Projected debris.
3. Hang fires, and returning too soon to the scene of blast.
4. Drilling into unexploded charges.

Playing with detonators and other explosives continues to take its toll of deaths and injuries. This cause alone in the five-year period accounted for 9 deaths and injuries to 229 persons, of which the greater number were children.

In nearly all these accidents juveniles have been permitted to have access to explosives through the carelessness of adults and thus there rests a responsibility on users of explosives to keep a strict record of their stocks and ensure their safekeeping.

APPENDIX A

Factories Licensed to Manufacture Explosives in 1943

Owner	Location of factory	General nature of product
Canadian Industries, Ltd.	Beloeil, Que.	Blasting explosives, black powders, propellants.
Canadian Industries, Ltd.	James Island, B.C.	Blasting explosives, black powders.
Canadian Industries, Ltd.	Nobel, Ont.	Blasting explosives.
Canadian Industries, Ltd.	Brainerd, Man.	Blasting explosives.
Canadian Industries, Ltd.	Brownsburg, Que.	Ammunition, detonators, etc.
Canadian Safety Fuse Co.	Brownsburg, Que.	Safety fuse.
T. W. Hand Fireworks Co., Ltd.	Dixie, Ont.	Fireworks.
B. Marroni.	Ville St. Pierre, Que.	Fireworks—Operation intermittent.

APPENDIX B

Explosives Imported into Canada, January 1, 1939, to December 31, 1943

Class	Division	Description	Quantity
I	.....	Gunpowder.	26,421 pounds
II	.....	Nitrate mixtures.	206,760 pounds
III	1	Mixtures containing liquid nitro-compound.	99,755 pounds
	2	Nitro-compounds:—	
		(a) Propellants.	1,980,364 pounds
		(b) For use in explosives factories.	526,101 pounds
		(c) For other manufacturing purposes.	12,000,327 pounds
IV	.....	Chlorates.	8,358 pounds
V	.....	Fulminates.	73,889 pounds
VI	1	Primers.	845,764
	2	Detonators.	557,320
	3	Safety fuse.	710,269 feet
	4	Miners' squibs.	856,000
	5	Detonating fuse.	5,730,133 feet
VII	2	Manufactured fireworks.	997,000 pounds
		Miscellaneous.	12,000 pounds

APPENDIX C

Accidents from Explosives, 1939 to 1943

Year	Use			Manufacture			Keeping			Conveyance			Miscellaneous			Total		
	Acci- dent	Killed	Injured	Acci- dent	Killed	Injured	Acci- dent	Killed	Injured	Acci- dent	Killed	Injured	Acci- dent	Killed	Injured	Acci- dent	Killed	Injured
1939....	107	24	106	3	2	3	2	2	6	.....	.....	.....	36	.....	46	148	28	161
1940....	53	14	51	1	1	.....	.....	.....	.....	.....	.....	.....	27	1	32	81	16	83
1941....	49	22	48	4	2	2	.....	.....	.....	1	1	1	59	2	76	113	27	127
1942....	43	17	44	3	4	6	.....	.....	.....	1	1	.....	34	1	44	81	23	94
1943....	40	12	36	.....	.....	.....	1	4	25	1	.....	.....	49	8	71	91	24	132
Total....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	514	118	597

APPENDIX D

Authorized Explosives

Explosives manufactured by Canadian firms as hereunder detailed:—
Canadian Industries, Ltd.

Polar Dynamite—25, 30, 35, 40, 50, and 60 per cent.
Polar Mineite—35, 40 per cent.
Polar Ammonia Dynamite—20, 25, 30, 35, 40, 50, and 60 per cent.
Polar Stopeite—20, 25, 30, 35, 40, 50, 55, and 60 per cent.
Polar Gelatinized Dynamite—50, 60, and 75 per cent.
Polar Forcite Gelatin—30, 35, 40, 50, 60, 75, 80, and 90 per cent.
Giant Gelatin—20, 25, 30, 35, 40, 50, 60, 75, 80, and 90 per cent.
Polar Monobels, 7 Sheathed.
14 Sheathed.
Polar Monobels, Nos. 4, 6, 7, and 14.
Polar CXL-ite No. 2.
Polar Cilgel.
Polar Driftite.
Gelatin Dough.
C. X. L. Special Gelatin No. 1.
C. X. L. Special Dynamite No. 1, No. 2, and No. 3.
Polar Stumping No. 1, Extra, and Dominion Stumping No. 1.
Blastol.
S. N. G.
Gypsumite "A", "B", and "C."
Cordite.
Black blasting powders.
Black powder pellets.
Gunpowder.
Sporting powders.
Safety fuse powders.
Safety fuse lighters.
Signal bombs.

Canadian Safety Fuse Co., Ltd.
Safety fuse—"Clover" brand.
Safety fuse—"Black Clover" brand.
Safety fuse—"Beaver" brand.
Safety fuse—"White Jacket" brand.
Safety fuse—"Crown" brand.
Safety fuse—"Moose" brand.
Safety fuse—"Pacific" brand.
Fuse lighters.

Canadian Industries, Ltd., (Dominion Ammunition Divn.).
Ammunition.
Detonators.
Lead Azide.
Lead Trinitroresorcinate.
Percussion caps.
Railway torpedoes.
Electric detonators.
Railway fuses.
Tetrazene.

All explosives on the British authorized list are provisionally authorized in Canada, and in addition those manufactured by the following firms, as detailed below:—

American Powder Co., Maynard, Mass.
American, R.C. 22 short.

Atlas Powder Co., Wilmington, Del.
Electric blasting caps, Nos. 6, 7, and 8.
Blasting caps, Nos. 6, 7, and 8.
Nitrocellulose.
Trinitrotoluene.

California Cap Co., Oakland, Cal.
Detonators.

Central Railway Signal Co., Boston, Mass.
Railway torpedoes.
Railway fuses.

Dumore National Chemical Co., Seattle, Wash.
Regina stumping powder Nos. 1 and 2.
Regina rock powder Nos. 1 and 2.

E. I. Dupont de Nemours & Company, Inc., Wilmington, Del.

Dupont bulk rifle powders (Nos. 80, 92).
Dupont smokeless shotgun powder.
Dupont pistol powders Nos. 5 and 6.
Dupont sporting rifle powders.
Balistite smokeless shotgun powder.
Improved military rifle powders.
Dupont dense smokeless shotgun powder.
Fulminate of mercury.
Guncotton.
Trinitrotoluene.
Tetryl.
Dynamite and blasting gelatin.
Agritol.
Cordeau connector cap and clip.

Ensign Bickford Co., Simsbury, Conn.
Cordeau-Bickford fuse.
Pull wire fuse lighters.
Primacord.

Hercules Powder Co., Wilmington, Del.
Bullseye revolver powder.
Hercules smokeless rifle powder.
Hercules smokeless shotgun powder.
Infallible smokeless shotgun powder.
Dynamite and blasting gelatin.
Vibrogel A, B, C, and 3.
Vibro caps.

Illinois Powder Manufacturing Co., St. Louis, Miss.
Ammonia dynamite—40 and 60 per cent.
Powdertol No. 1 and No. 3.

Independent Eastern Torpedo Co., Findlay, Ohio.
Nitroglycerine.

King Powder Co., King's Mills, Ohio.
Semi-Smokeless powder.

John R. Powell, Plymouth, Pa.
Miners' squibs.

Safety Mining Co., Chicago, Ill.
Cardox.

Trojan Powder Co., Allentown, Pa.
Trojan blasting, CC
Trojan TL 502.
Trojan 35 per cent standard.
Trojan 40 per cent standard.
Trojan 40C.
Trojan 50C.

United Railway Signal Corporation, Newton, Mass.
Railway torpedoes.

Western Cartridge Co., East Alton, Ill.
Detonators.

Authorized Explosives (Manufactured Fireworks)

Manufactured fireworks on the British authorized list are provisionally authorized in Canada.

All fireworks as manufactured by the following Canadian makers are authorized:—

Macdonald Metal Products Company, Ltd., Waterloo, Que.
Marroni, Berardo, St. Pierre, Que.
Toronto Fireworks Co., Ltd., Islington, Ont.
T. W. Hand Co., Ltd., and Dominion Fireworks Co., Dixie, Ont.
Hitt Fireworks Co., Port Moody, B.C.

Certain fireworks manufactured by the following foreign makers are authorized:—

United States:

Acme Pistol Co., Columbus, Ohio.
American Fireworks Co., Boston, Mass.
Antonelli Fireworks Co., Rochester, N.Y.
Backes, M. Sons Inc., Wallingford, Conn.
Burke and James Inc., Chicago.
Central Railway Signal Co., Boston, Mass.
Continental Fireworks Manufacturing Co., Dunbar, Pa.
Coston Supply Co., New York.
Edmiston Manufacturing Co., Columbus, Ohio.
Edwards Co., Cincinnati.
Essex Specialty Co., Berkeley Heights, N.J.
Federal Buster Corporation, Pittsburgh.
Hill, E. Vernon, Chicago, Ill.
Hitt Fireworks Co., Inc., Seattle.
Hubley Manufacturing Co., Lancaster, Pa.
International Fireworks Co., New York.
International Flare Signal Co., Tippecanoe City, Ohio.
Interstate Fireworks, Springfield, Mass.
Jedel, A., Newark, Del.
Kilgore Manufacturing Co. Inc., Westerville, Ohio.
Los Angeles Fireworks Co., Los Angeles.
Marshall, John C., Brooklyn, N.Y.
National Fireworks Inc., West Hanover, Mass.
New Jersey Flugent Co., New Brunswick, N.J.
Norman Willets Photo Supply Co., Chicago.
Potts Fireworks Display Co., Franklin Park, Ill.
Red Flare Signal Corporation, Frostoria, Ill.
Rochester Fireworks Co., Rochester, N.Y.
Safety Automatic Toy Co., Dayton, Ohio.
Smith, Jas. H., Griffith, Ind.
Standard Railway Fusee Corporation, Boonton, N.J.
St. Louis Pistol & Caps, Inc., St. Louis, Mo.
Triumph Fusee and Fireworks Co., Elkton, Md.
Unexcelled Manufacturing Co., Inc., New York.
Victory Fireworks and Specialty Co., Elkton, Md.

Small Chinese fireworks and Chinese firecrackers with gunpowder composition, and not exceeding four inches in length and nine-sixteenth inch in diameter, are authorized when found to function satisfactorily on examination at port of entry.

